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SIBERIA'S ROLE IN SOVIET STRATEGY*

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As we relearn the geography of 1942 in terms of the Second World War, it is well to view the Union of Soviet Socialist Republics with adequate perspective. Here is a nation as big as all of North America. For the past fifteen years, it has been in the midst of a virile economic expansion which is creating a major industrial state. American public opinion has been very reluctant to recognize what has been happening, but the military evidence of recent weeks makes it clear that any nation which can afford to lose tens of thousands of planes and tanks, and millions of men, and still take the initiative, has greater productive capacity than realized.

Will the Soviet Union defeat Germany alone? Probably not, but without the U.S.S.R., Britain and the United States might find the job insuperable. Should the Soviets collapse, Germany and Japan would have access to each other and to the resources of northern Eurasia. Much depends on the capacity of the Soviet Union to carry on effective production, and this in turn rests on geological and geographical considerations. What is Siberia's role in Soviet strategy?

GEOGRAPHIC REALMS

Within the Union of Soviet Socialist Republics are five major realms. In the center is an agricultural zone which forms a thin triangle projecting eastward to Lake Baikal. Here are most of the people and the bulk of the industry. To the north are two lands of cold, the taiga and the tundra. To the south are two lands of drought, the steppe and the desert. Russian expansion has driven the wedge of settlement eastward into Siberia between the steppe

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and the forest. At the same time this advance has pushed the frontier northward and southward into areas of shorter and shorter growing seasons on the one hand, and areas of marginal rainfall and famine hazard on the other.

Most of Soviet Asia lies in the unattractive realms of cold or drought. Essential Siberia is limited to a strip along the wisely located Trans-Siberian Railway. There are important mineral deposits on either side, but the developed reserves, the major industries, the agricultural production, and the chief cities all lie near this transcontinental highway. Within this tapering end of the triangle are still large agricultural possibilities. The pioneering nature of Siberia is shown by the increase of population from 10,400,000 in 1914 to 25,636,900 in 1933, while cultivated land rose from 32,058 square miles to 97,949 square miles.

ECONOMIC DEVELOPMENTS

Since 1928, the Five Year Plans have laid great stress upon the development of heavy industry. This has enormously increased mineral production, industrial output, transportation facilities, and urbanization thruout the Union, but especially in the Ural Mountains and in Siberia. The strategic value of these developments is obvious both in the current war with Germany, and in any possible conflict with Japan. Geographers have played a significant role in the various planning boards, for the Soviets conceive the function of geography to be "the development of the productive resources of the state."

In terms of transportation, the Union's weakness is still the lack of a second transcontinental line across Siberia. The existing road is double tracked and carries an enormous volume of traffic. In 1937, I counted passing freight trains on several occasions, and found an average of one each 17 minutes. Altho there is still no parallel line, an extensive mileage of auxiliary railways has been completed in the inter-war years. Western Siberia already has the beginnings of an orderly rail net. In the east, a new line north of Lake Baikal has been under way for five years, and should be nearing completion. In view of the ease with which the Japanese might cut the existing railway around the north of Manchuria, this alternate route is of major strategic value. Not until it is in operation would the Soviet Union be in a position to wage effective war against Japan.

The development of Siberia has stimulated the growth of cities, many of which have doubled or trebled their population in the inter-war years. There are now ten centers in the Urals and eastward whose population exceeds 200,000. While they do not compare with Soviet Europe in urbanization or industry, they nevertheless represent great productive capacity. Both Sverdlovsk and Novosibirsk exceed 400,000.

MILITARY PROSPECTS

This is a war of competitive production, so that access to raw materials is of vital importance. Fortunately the U.S.S.R. is rich,

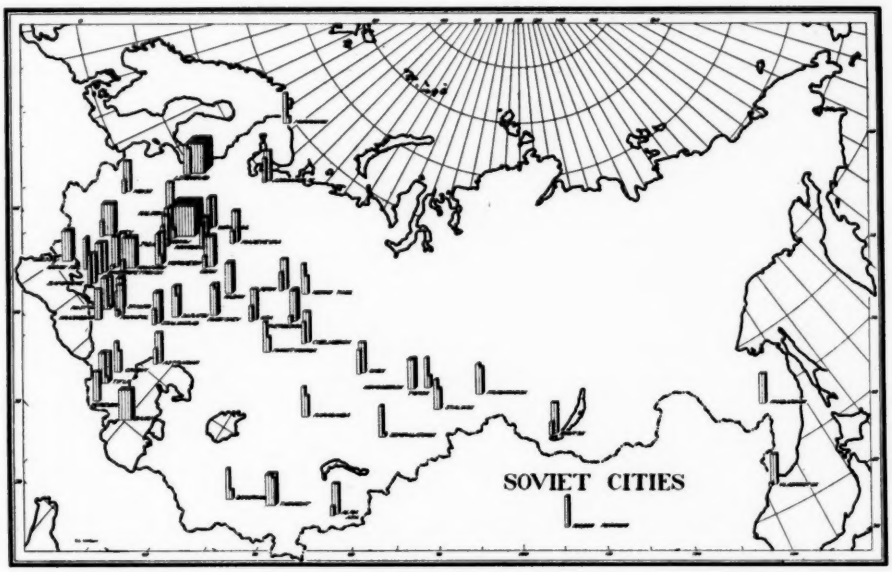

Fig. 1. Soviet Cities

second only to the U.S.A. in mineral wealth. It is true that Soviet estimates are often over-optimistic, but the general picture is clear.

To sum up the military prospects, it appears probable that even tho Germany should occupy all of Soviet Europe, or even tho Japan should seize Vladivostok, the Ural Mountains and central Siberia still have enough mineral wealth to enable the U.S.S.R. to maintain significant military production as long as the Second World War may last. This applies not only to undeveloped reserves but to actual mines, smelters and factories now in operation.

I shall review the various resources in a moment, but the situa-

tion is well in hand with respect to coal, iron, copper, lead, zinc, and gold. Problems may arise concerning oil, aluminum and manganese, but there is a limited output of each within Siberia. In addition to Siberian reserves, there is still great productive capacity in unoccupied Soviet Europe, notably the apatite of the Kola peninsula, the brown coal and hematite near Moscow, and the coal of the Ukraine. Large resources of oil, manganese, lead and zinc are available in the Caucasus, and Turkestan is also well supplied with minerals, but this paper is limited to Siberia.

COAL IN SIBERIA

The Soviet Union now credits itself with 1,654,361,000,000 metric tons of coal, second to the U.S.A. Ninety per cent of this reserve lies in Siberia. So far as current *production* is concerned, three-fifths comes from the Donetz field in the Ukraine, but there has been a great expansion in newer areas in Asia. This is notably true in the Kuznetz Basin of central Siberia where the current production exceeds 20,000,000 tons, the equivalent of the output in Ohio. In this Kuznetz field the bituminous reserves are more than 450,000,000,000 tons, equal to our entire Appalachian field.

Within the Ural Mountains, coal is mined to the extent of 8,000,000 tons, chiefly at Kizel and Chelyabinsk, but none of it is of coking quality. Elsewhere in Siberia is the new Karaganda field, north of Lake Balkhash, with an output of over 4,000,000 tons; near Lake Baikal are the Cheremkhovo mines yielding 3,000,000 tons; other mines near Vladivostok produce nearly 3,000,000 tons; and a new field is developing at Bureya near the Amur River.

The annual yield of coal in Soviet Asia is 40,000,000 tons out of a national total of 146,800,000 (1940). While the total is but a third of American production, it is quadruple the Tsarist output. Since the Kuznetz area is more than 2,000 miles from both German and Japanese frontiers, its operation appears reasonably dependable.

SOVIET OIL

Petroleum production is no longer concentrated in Baku or even along the slopes of the Caucasus, altho these still dominate. Northeast of the Caspian Sea is the important Emba district with salt dome structures. From the Urals westward to the Volga River is another new oil field, so promising that the Soviets term it a "second Baku." Siberia proper appears to be very poor in oil,

but there is a significant production on the island of Sakhalin north of Japan. A pipe line runs from the Emba fields to Omsk in central Siberia. So long as Baku remains in Soviet hands, there will be no shortage, and the Caucasus Mountains present a formidable barrier to invasion.

IRON AND STEEL

Iron ore is widespread in the Urals, and the total reserves are placed at 1,390,607,000 tons. This forms the basis of imposing blast

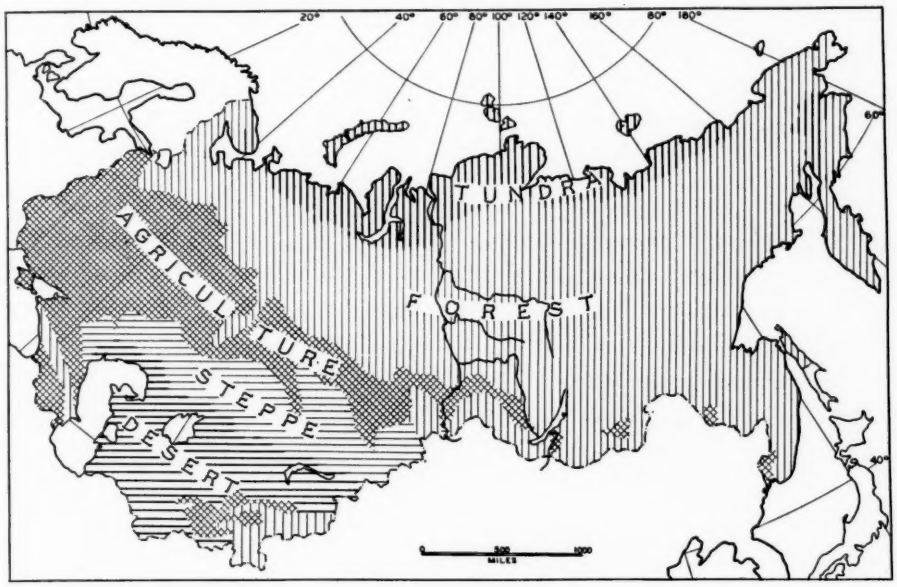

Fig. 2. Land-use Regions

furnaces at Magnitogorsk, Sverdlovsk, and Nizhni Tagil. These have a combined annual capacity of approximately 10,000,000 tons of pig iron, and open hearth furnaces turn out almost as much steel. The furnaces at Magnitogorsk are said to rank next to those of Gary in capacity.

Siberia's metallurgical problem does not concern any shortage of iron ore, or of coking coal. The difficulty lies in the long rail haul required to bring them together. In the case of the Ural plants, coal is brought 1,417 miles from Kuznetz in central Siberia, while on the return trip the trains carry ore to blast furnaces near the coal. Steel plants thus operate at both ends of the combine. I have spent five days in the Kuznetz Basin, going thru mines and

blast furnaces, and found them up to the best American standards. Since the development of Kuznetz, nearby ore has been found which nearly meets the need of the local furnaces. At the same time coal for the Urals has been developed at Karaganda, much closer to Magnitogorsk ore; thus the transport problem is lessened. The Ural-Kuznetz combine has grown to the point where it now supplies one-third of the nation's iron. There is a small iron output east of Lake Baikal, and a blast furnace has recently been built in the Far East at Komsomolsk on the lower Amur River.

Manganese has been largely obtained from sources in Soviet Europe. Within Siberia, there is a limited production of low grade manganese in the Urals, in the Kazakh Republic, and near Kuznetz. While inadequate, these Asiatic deposits provide an emergency supply.

NON-FERROUS MINERALS

Reserves of copper have been greatly expanded under the Five Year Plans, but the quality of the ore is poor. There is a small production in the Ural Mountains, but the largest mines are north and west of Lake Balkhash. These are porphyritic deposits with about 1.1 per cent copper. A new smelter at Kounrad has an annual capacity of 100,000 tons of metal, and even larger works are getting under way at Djezkazgan.

Lead and zinc reserves are estimated at 11 and 19 per cent of the world totals, respectively. Soviet production is from the northern Caucasus, from the important Ridder mines in the Altai Mountains, and from scattered Siberian deposits. Lead production in 1936 amounted to 55,000 tons, while in the same year, zinc totaled 63,000 tons.

Aluminum was regarded as a deficit metal in Tsarist Russia because the known bauxite deposits were limited and poor. Within recent years, the U.S.S.R. has built up a significant output, amounting to 60,000 tons in 1939, which lifted the nation to fourth place. Two deposits in the Urals supply a considerable part of the bauxite: Kabakovsk in the north and Kamensk in the south. Unfortunately the chief reduction plants are in those parts of Soviet Europe currently occupied by Germany.

Siberian mineral production also accounts for enough gold to place the Union next to South Africa in second place. This is secured partly from lode mines in the Urals but chiefly from placer works along the tributaries of the Lena River, notably the Aldan.

Other Siberian localities are along the Kolyma and Yenisei Rivers. Modest amounts of nickel are mined in the Urals and Arctic. Within the Urals are large amounts of platinum, chromium, asbestos, potash and magnesite; while small amounts of tin and tungsten are produced east of Lake Baikal.

MINING AREAS

To turn from specific resources to mining areas, two major districts stand out, along with three lesser areas. By far the most valuable is the Urals, for there are few mountain ranges on earth

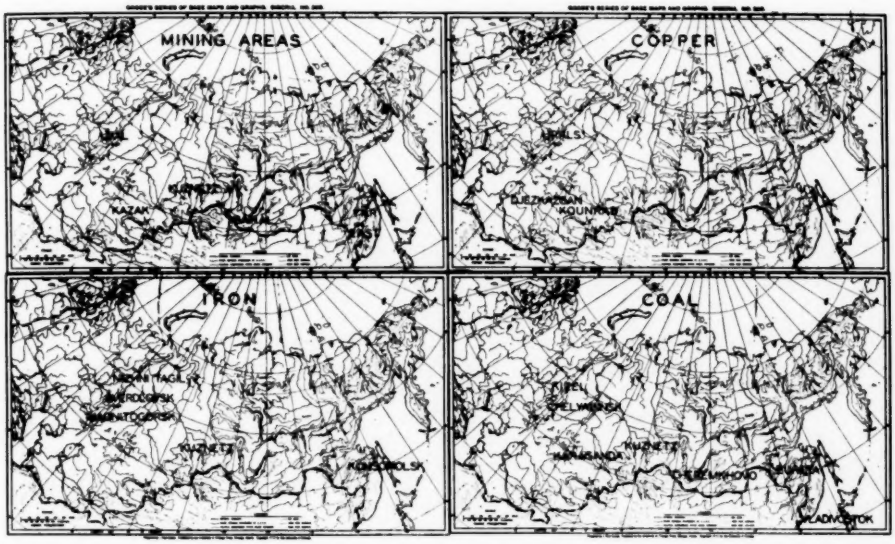

Fig. 3. Mining Areas

which produce the variety or quantity of minerals secured here. Iron has been mined since the days of Peter the Great, and there are now thirty-nine localities which produce iron or steel. Great metallurgical plants provide the base for scores of industries, notably railway equipment, automobiles, tractors, heavy machinery, and chemicals. Coal is mined in the Urals but is not of metallurgical quality. Oil is available on the western flanks, and also to the south. Non-ferrous minerals include gold, silver, platinum, copper, nickel, aluminum, manganese, lead, zinc, chromium, asbestos, magnesite, potash and salt. All of these place the Urals next to the Ukraine as the Union's number two metallurgical base. There are eight industrial cities of over 100,000 people, led by Sverdlovsk.

The Altai-Sayan Mountains of south-central Siberia are a region whose mineral significance has scarcely been appreciated by non-Russians. Here is a third of the country's coal, lead and zinc, plus significant occurrences of iron ore, silver, gold, copper, tin and manganese. The coal basin of Kuznetz dominates this second industrial base of Soviet Asia. The development of the Kuznetz steel works is one of the triumphs of the First Five Year Plan.

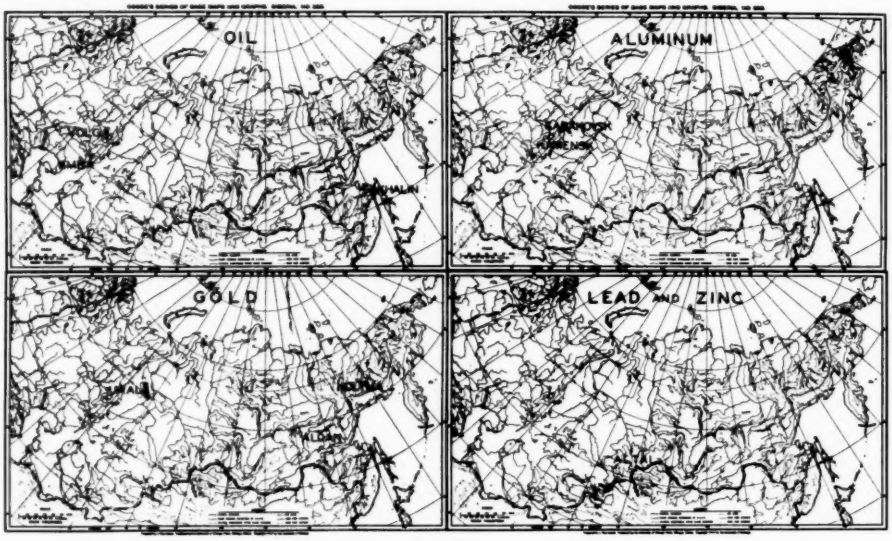

Fig. 4. Mining Areas

Third in significance is the Kazakh area, north of Lake Balkhash where Karaganda coal and Kounrad copper have been developed in the inter-war years.

The fourth of Siberia's minerally-productive districts lies around Lake Baikal, while the fifth is along the Amur River in the Far East. Reserves in each are considerable but production is only partly developed.

While Far Eastern developments are vulnerable to Japanese attack, production in the Urals and at Kuznetz seems secure from any feasible invasion whether from east or west. If mineral production will win the war, the Union of Soviet Socialist Republics has what it takes. And in the post-war world, it seems inescapable that the Soviet Union's geological foundations will place it in the first rank among industrial nations.

USES OF THE STRATEGIC AND CRITICAL MATERIALS: MILITARY EFFICIENCY*

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INTRODUCTION

New machines, ingeniously devised, are secretly moved to the front lines of those at war. Military men wait tensely for word of how the newest developments have stood the stress of actual conflict. News arriving from the modern battlefields indicates the great importance of slight efficiency advantages of one war machine over another. Results of the great struggles between forces of mechanized equipment emphasize the importance of incorporating the very best of materials and men in the modern military set-up. The outcomes of modern war may well rest upon the ability of one faction to outbuild another in the quality and quantity of its war machinery and to outmaneuver the other in the use of it, rather than on the ratio of man power in embattled countries. Never in the history of mankind have technical machinery and vital materials played such a tremendous part in military decisions.

ON LAND

Like a monster from another world, a mammoth tank crawls from a forest, breaking down sizeable trees and clearing its path of other obstructions. It is difficult to realize that this giant monster was devised in the peace and quiet of the laboratory and the factory far from the scene of the struggle. It is operated by a force of technicians who pamper it with every attention. Much of its power, speed, and efficiency springs from the origin of its parts, gathered from many parts of the world.

At intervals, it must be carefully checked and repaired just as meticulously as in the case of the prize-fighter or the bed-ridden patient. A mistake or an oversight may be just as consequential in the case of this apparently crude yet delicate machine of destruction as in the case of a human being.

* This manuscript constitutes what the author considers a logical development of one phase of the project suggested in the January, 1942, issue of the JOURNAL OF GEOGRAPHY under the heading of "National Self-Sufficiency." The emphasis is on the materials included in the list of Strategic and Critical Materials designated by the Army and Navy Munitions Board. Only a few of the most important of the many military uses of the materials are considered. Many vital materials, of which we have an ample supply, are not considered in this article.

Military equipment must be tough, hard, strong, resilient, and resistant to both natural elements and mechanical force. The steel in the body of the tank was toughened with the proper percentages, forms, and combinations of basic iron ore with manganese, vanadium, nickel, and, perhaps, small quantities of tungsten, tin, and similar materials.

Additions of vanadium, a ductile metal, to its axles, cranks, pistons, springs, and other vital parts where there is a tendency for metals to crystallize and break, have imparted added strength and resiliency. Some of its great strength may arise from the additions of quantities of chromium. Tungsten may have been added to the alloy steels to increase its tensile strength.

Manganese has added both strength and resistance to abrasion to the armor plate, tread, and other parts. These are greatly desired qualities on battlefields of mud, sand, and other unfavorable conditions. Nickel and chromium have rendered it resistant to heat and acid and have imparted special qualities of hardness. Vanadium and tin have fortified vital parts against corrosion.

Into its bearings, rendered tough with manganese, has gone babbit metal, the soft, white anti-friction metal of tin, copper, and antimony. Mica was used in the manufacture of the high-grade spark plugs, while proper use of asbestos in clutch facings and brake linings encourages easy handling. The quality of its storage batteries has been enhanced by the proper use of antimony and lead.

Nickel in the barrel and the recoil cylinders, tungsten in the breech, and necessary tin in certain parts have aided in rendering the tank gun a formidable weapon. Tungsten in the bullet core and the inclusion of nickel and antimony in the alloys have made possible a deadly projectile which may pierce the armor plate of another tank, even tho the latter may have been rendered hard by additions of nickel and tungsten. The projectile may be started on its journey on an instant's notice by the striking of a percussion cap filled with a white salt (fulminate of mercury). This explosive salt was produced by treating mercury with nitric acid and adding alcohol.

A huge dredge, its bucket teeth tough with manganese, gouges the way for the laying of rails, frogs, and switches rendered tough with the same material. Due to the manganese in combination with other vital materials, the dredge resists the scratching and goug-

ing of the rocks and dirt, and the rails, frogs, and switches withstand the strain of the heavy loads of war materials being rushed to the front by locomotive and rail equipment.

Aluminum plays an important part in a modern army. It speeds up transportation on land, in the air, and on the sea because of its qualities of strength and lightness, essential characteristics of airplanes, rolling field kitchens, mess kits, and other portable supplies. Used for tires, cushioning effects, and a myriad of other purposes, the great military value of rubber goes unquestioned.

One might almost say that an army travels on its food containers. There is as yet no satisfactory economic substitute in quantity for the tin can as a food container for military purposes. The anti-rusting qualities of tin are much desired.

The modern army must be clothed as well as fed. Enormous amounts of wool are needed for making clothing, upholstery and blankets, and in the manufacture of various types of camp equipment. Heavy leathers are needed for shoes, belts, saddles, harness, and many other purposes.

The modern army needs the best in medicine. Iodine, and other antiseptics, opium, and other important drugs for relieving pain, and quinine, the best known medicine for prevention and treatment of malaria, are all recognized for their great value. Phenol derivatives (carbolic acid, picric acid, etc.) are used in various medicines which increase the effectiveness of the medical wing of the service.

The total population of a nation at war, as well as the armed forces, may need gas masks. The absorbent qualities of coconut shell char makes it an excellent filling for gas mask canisters.

The modern army must know its weather. Its movements are significantly affected by the action of natural agents which are checked on by the use of various weather instruments. Mercury is widely used in barometers and thermometers.

Dry cell batteries into which quantities of manganese, mercury, and graphite have gone, make possible the use of radio, flashlight, and other similar equipment when power plants are wrecked and communication systems are disrupted, or in many places where other means of communication and light are unavailable. Tungsten wires can be heated safely to a white heat. Because of this property, the metal is a valuable filament in electric light bulbs.

In the Sky

Overhead an airplane may be carrying a deadly bomb filled with TNT, a violent explosive produced by nitrating toluol, a product of bituminous coal. Other phenol derivatives may be used in various explosives. Or, perhaps, an incendiary bomb, containing iron oxide, flake or grain aluminium, and magnesium, will soon be released on its target.

The aviator and the airplane are to the army and navy today what the Indian scout and the horse were to the emigrant train in the early days of the United States. They prepare the way for the advancing forces. The fine optical content of the field glass and the camera enables the aviator to examine the countryside beneath him and to carry pictures and other information back to military headquarters. The fine glass in his bombsight enables him to take deadly aim on a target far below.

Thanks to antimony and silk, he may see his target at night thru the releasing of a pyrotechnic parachute which incorporates these materials. The modern military airplane must be constructed from the strongest, lightest metal obtainable in sufficient quantity. Aluminum is the present day answer to the problem. A large percentage of the modern airplane consists of aluminum. This makes possible greater human, bomb, gun, and ammunition load carriage than would otherwise be possible.

The use of the airplane is greatly enhanced by the radio. There is no satisfactory substitute for quartz crystal used in radio frequency control. Strategic tungsten enters into the making of the tube filament, and mica is used in the condensers, tube bridges, magnetos, armature windings, commuter segments, ring cones, and transformers.

On the Sea

There is an SOS on the high seas, and a great warship steams to the rescue. Anti-fouling paint, rich in mercury, has been spread over its massive hull. Its thick armor plate, containing nickel and tungsten, is hard and tough. The valuable optical lens of its telescope and range finder enables the officials to scan the horizon for enemy and friend. Thru the excellent lens in the periscope of the hunted submarine, the warship is discovered, and the submarine drops from sight below the surface of the ocean.

Powder, in bags of silk, is ready for use on short notice. The powder charge, packed in a silk container, is loaded by hand be-

hind the projectile. Silk is highly prized for its clean burning qualities, especially where men are at work in close quarters on a crowded battleship. Char and spark may result from the use of a substitute for the silk, and dire consequences may follow.

Asbestos used as insulation about the boilers and pipes, as well as for gaskets and packing in steam-driven machinery, aids greatly in rendering the ship both cool and safe. Asbestos gloves encourage efficient handling of overheated parts under trying circumstances. Cork may be found about the ship in the form of insulation or as marine goods of various kinds.

If a fire should start aboard ship, tin, combined with other metals of low melting point for use in fire extinguishers and alarms, may play a vital part. If people must desert the ship, it may be the floating qualities of kapok in their lifesaving belts which save them from a watery grave.

A most important item on the ship is the rope made from Manila fiber. It exceeds all substitutes as to its tensile strength, resiliency, elasticity, length of life under weathering, and in retention of size when wet.

ON THE HOME FRONT

While engrossed with events transpiring on the battle front, people are prone to overlook significant happenings at home. Yet to say that what is happening in battle is more important than what is transpiring at home, is like stating that the carburetor of an automobile is more important than the car.

Significant things may be occurring on the farm, in the mines and forests, and in the laboratories and factories, while a nation is engaged in war. These less noticeable events or developments, perhaps quietly transpiring, may determine the eventual outcome of the struggle. Modern war is fought on the home front as well as on the battle front. This is especially true in modern war, since the airplane has somewhat blurred the old distinction between the two fronts.

In order to present a balanced picture of a nation's total war effort in terms of the strategic and critical materials, it may be well to briefly point out some of their uses on the home front.

The modern military machine is made possible and kept in running order by the use of good machine tools. Tungsten makes its most valuable contribution to the military machine in the form of tools for metal cutting. It has the highest melting point of all metals

(3370°). At high speeds and at high temperatures it retains its toughness and hardness. Tungsten tools can be driven at speeds which would render ordinary carbon steels useless and will continue cutting when red with heat. Industrial diamonds are also a valuable aid in various types of drilling and cutting.

By means of efficient tools with which to carry on activities in the workshops of the nation, an efficient military machine may be kept in the field, and necessary home industries continued in operation.

The graphite crucible is considered a wartime necessity, altho it is no longer used in the manufacture of ingot steel. It has recently been used in connection with special castings of bronze and other copper alloys for naval and merchant vessels.

Tin is a valuable metal in the laboratory and factory. It is often used as a solder or as a flux in binding other metals. Nickel, platinum, and vanadium are used as catalysts. Vanadium is used in the manufacture of sulfuric acid. Nickel is extensively electroplated on other metals. Aluminum removes gases and impurities in the smelting of steel, hardly a trace remaining in the resulting product. Small amounts of manganese remove gas from steel; it is used in all steel manufacture as a deoxidizer and purifying agent.

Platinum has a variety of uses in the laboratory and in the electric fields. It is excellent in receptable form in the laboratory for the handling of corrosive liquids. It is also used for the manufacture of precision instruments such as resistance theremometers.

The chemical field makes use of antimony and tin. Tin is rolled into foil and used as a chemical. One finds cork stoppers and items of cork composition about the laboratory. Asbestos, a chemical resistant, also has a place in the laboratory. Fine optical glass is needed for the better microscopes. The tanning industry uses quebracho tannin from the Chaco of South America. Chemical tannins as well as vegetable tannins are used. Tungsten salts and chromium are well recognized for their tannin properties.

A World at War

The great armadas of the struggling powers clash on the battlefields of land and sea. The Japanese sink British and American ships with strategic and critical materials imported from Britain and the United States. American sailors shove powder packed in bags of Japanese silk into their guns in a naval war with Japanese

vessels. The Japanese vessels are constructed largely from materials imported from friendly nations which are now their enemies. Germany makes war on Russia with Russian manganese, and Russia strikes back at her recent ally.

As strategic and critical materials sink beneath the surface of the ocean or are rendered ineffective thru land operations, they must be replaced by those suffering the loss if the struggle is to be continued. The whole world is grasping for vital materials with which to destroy or offset enemy forces and thereby gain security. Political and military maneuvers are constantly transpiring as nations seek to gain control of these materials—to gain them for their use, and to prevent their falling into the hands of their enemies.

AGRICULTURAL SURPLUSES IN RELATION TO TRADE BETWEEN THE UNITED STATES AND CANADA

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In the present unsettled era, with war activities in the Old World already disturbing world trade patterns, the Americas are embarking on a course of mutual protection and friendship. The differences and distrusts of the past are being laid aside for the benefits of mutual defense and closer political and economic cooperation.

BASIS FOR AGRICULTURAL EXCHANGE

A study of economic relations between the United States and Canada reveals that in many respects the two countries are complementary, a fact which makes for vital trade relations between the two. In agricultural production, on the contrary, there is a marked similiarity between Canada and great parts of the United States.

It is noteworthy that the economic development of Canada and of the United States has proceeded along similar lines. In early days the two countries looked to Europe for impetus for development of resources, industry, commerce, and transportation. Both countries were at first chiefly exporters of agricultural products and importers of manufactures.

Economically Canada is today, however, a young country as

compared to the more mature United States. Agriculture is still Canada's single leading occupation, employing 28.8 per cent of its 11,000,000 people; whereas the United States is now dominantly industrial, 28.6 per cent of the population being employed in industry as against 22.5 per cent in agriculture.

Culturally Canada is like us in habits and customs and in language. Its people have a rather high level of living. The stage of development of Canada is, however, somewhat less advanced than that of the United States. Cultural similarities tend to foster trade relationships as do also proximity, accessibility, good transportation facilities and the common use of the dollar.

Altho agriculture is Canada's leading occupation, physical factors (topography, climate, and soils) restrict both the extent and the diversity of crops. Physical conditions likewise foster a duplication of certain Canadian crops across the border in the United States.

The natural landscapes of southern Canada closely resemble those of northern United States, since the east-west international boundary line generally bisects the north-south trend of physical provinces. From the Western Cordilleran mountain subprovinces in the west to the New England-Acadian hilly belt in the east, the unguarded international boundary along 49° trends invisibly across the glacially-mantled series of surface features.

Canada, like Russia, is handicapped by a northern location and by gigantic size. Canada, however, has no fertile triangle; in lieu, it has four main farmland areas, comprising the Maritime Provinces, St. Lawrence Lowland, Ontario peninsula, and the three Prairie provinces. Winters are long and cold in southern Canada. Except for southwest Canada and lower Ontario, all of Canada averages about 15°F. in January. The growing season varies from two to four months and summers average 60° to 70°. The low evaporation rate makes precipitation totals of 10 to 35 inches more effective than the same totals in the United States. Variability of rainfall and fluctuations in the length of the short growing season divide the years of the Prairie grain farmer into good and bad. What drought is to the southwest, frost is to the north in the prairie land. Other climatic influences reacting upon the character of agricultural land utilization in southern Canada are the Chinook winds, longer summer days, rain shadows, protected valleys, and re-precipitated snow.

Soils further limit the amount and kind of crops grown in Canada. Podzols and podzolic soils predominate, they being acid, cold, and thin. The gray-brown soils in the St. Lawrence valley and Ontario peninsula are moderately fertile, but quite productive. Only in the Prairie provinces do the pedocals offer truly fertile soils. The variety of agricultural products that can be grown in Canada is distinctly more limited than in adjacent United States.

Only 7 per cent (163,000,000 acres) of Canada is classed as land in farms. These areas coincide chiefly with the four farming areas, the rest of wintry Canada's 2,000,000,000 acres being forests, lakes, muskegs, rocks, mountains, and snowy wastes. The physical factors of location, area, topography, climate, and soils in combination favor agricultural production (including an exportable surplus) within the four farm areas, but limitations within each area, locally and marginally, operate to cause fluctuating yields and retardation of any appreciable agricultural expansion.

The acreages of Canada's three leading crops were, in 1939: wheat, 26,757,000 acres; oats, 12,790,000 acres; and hay and clover, approximately 9,000,000 acres. Each of these crops is areally confined by rather sharp climatic lines, or by physiographic and edaphic borders.

CANADIAN TRADE IN AGRICULTURAL PRODUCTS

Wheat is Canada's leading agricultural export. Considerably behind wheat, in order of export value (1939), are: meats (chiefly bacon and hams), fruits (principally apples), cheese, cattle, barley, vegetables, raw tobacco, hides and skins, processed milk, and others.

Forty-five per cent of Canada's agricultural exports normally go to the United Kingdom; fifteen per cent to the United States. The list of Canadian agricultural items imported by the United States is as follows: cattle and other stock, meats, wheat (chiefly re-exported), other grains (such as barley, oats, and rye), late vegetables (especially potatoes and seed potatoes), fruits (apples), cheese and other dairy products. The length of the list is deceptive: the value of Canadian farm products shipped to the United States was only $34,100,000 in 1938 and $57,600,000 in 1939 (a war year).[1]

Canada is the second-ranking market for United States farm

[1] Taylor, C. C. Canada's Wartime Agricultural Measures, *Foreign Agriculture*, June, 1940, p. 337 (table).

products, importing raw cotton, fresh fruits (particularly grapes and citrus fruits), certain fresh vegetables (mainly tomatoes), hides and skins, tobacco, and corn. In 1939 Canadian imports of agricultural products from the United States were valued at $69,100,000, as compared with $64,100,000 in 1938.[2] Exports from the United States to Canada are chiefly of manufactured goods, whereas those from Canada to the United States are principally forest products and minerals, farm produce, and fish. Most of the trade between the United States and Canada crosses the border between Montreal and Detroit.

Of the total value of United States foreign trade in agricultural products from 1936 to 1939, exports amounting to at least $100,000,000 and imports of about $20,000,000 were directly attributable to the United States reciprocal trade agreements program, involving nearly twenty nations.[3] Commodities benefiting were, typically, those burdened by heavy domestic surpluses, particularly wheat and other grains, lard and pork products, citrus fruits, and fresh apples, fresh vegetables, canned fruits, and nuts. Under this program our exports to Canada have increased. A new trade agreement between Canada and the United States became effective January 1, 1939 by which Canada again granted substantial concessions on agricultural products. Further reductions are made by the United States in duties on Canadian agricultural products, but some of these are safeguarded by quota limitations. Likewise some products move free of duty from the United States into Canada, such as cotton, lemons, hides, and certain vegetables. Others are limited by quotas as, for example, fluid milk and potatoes.

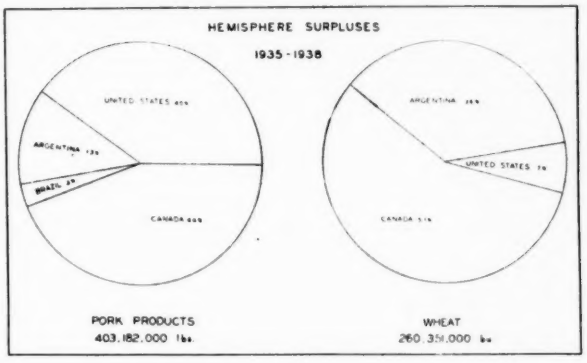
The question arises: how dependent is Canada upon American farm produce and vice versa? There is a reciprocal movement of vegetables, fruits, and grains in trade. Each Canadian farm export is available here. But this is not true for certain Canadian imports from the United States, as for example, cotton, citrus fruits and corn. Thus, even tho in some years the value of agricultural trade between the two countries is nearly balanced, Canada is much the more dependent upon us, for it lacks a subtropical region.

[2] *Ibid.*, p. 336.

[3] Goodwin, Ellis M. Trade Agreements and Agricultural Foreign Trade, *Foreign Agriculture*, Feb., 1941.

PROBLEM OF HEMISPHERE SURPLUSES

World political events of the last decade have upset the operation of the principle of comparative advantage in determining the crops of an area. The growth of protectionism and the doctrine of economic self-sufficiency of nations caused dislocation of commerce in basic foodstuffs and raw materials even before the inauguration of direct barter by totalitarian powers. Climaxing in the present war, these conditions make European markets for American agricultural products exceedingly questionable for the next few years.



Canada will be burdened with a surplus in three products if its trade with the United Kingdom be curtailed by the fortunes of war. Normally Canada sells large amounts of both wheat and pork products outside the Western Hemisphere and a small amount of hides and skins. During the last four years before the war (1935-38),[4] Canada averaged exporting 3,570,450 pounds of hides and skins annually, or one per cent of the total moving from this hemisphere. During the same period, Canada was responsible for an average of 148,400,000 bushels, or 57 per cent, of the net hemisphere surplus in wheat (that is, the excess of hemisphere exports over imports). Canada also produced 44 per cent, 403,182,000 pounds of the surplus of pork products.

In facing the problem of what to do with wheat and pork surpluses, the United States appears in the role of a competitor of Canada, with surpluses in both these products to market itself. Actually the problem of competition in wheat is far greater than that revealed by figures from the years 1935-38; by that time the government of the United States was already fostering a program of production for domestic market only, under the quota system of the A.A.A. The pork surpluses of the two countries are about the same.

[4] Apodaca, J. L. Agriculture's Role in Hemisphere Defense, *Foreign Agriculture*, March, 1941, p. 83-103.

There is no easy solution to the problem of hemisphere surpluses. Serious difficulties and dangers attend any such economic adjustment. In general the difference between the amount of food produced and the amount consumed may be eliminated by either of two methods, or by the two used in conjunction: on the one hand, consumption may be increased, or on the other hand, production may be decreased. Consumption might be increased by large-scale relief distribution systems, arrangements by which foodstuffs are made available by governments to people who would not be able to purchase them. Inter-governmental exchange of surpluses could be one phase of such a plan of relief distribution. A general lowering of tariffs of surplus American crops might in itself effect some increase in consumption. Production of the various surplus products could, however, be curtailed by a system of international commodity agreements setting up quotas.

In the absence of what might be termed politico-economic measures toward readjustment, a natural adjustment would take place. Some of the farmers now growing the "surplus" crops would eventually shift to others; some would be forced from agriculture to other occupations. Such an adjustment would be costly in human resources.

In conclusion, then, American supplies of grains, meats, vegetables and cheese are regularly supplemented by receipts from Canada. American cotton and citrus fruits on the Canadian market are non-competitive with Canadian agriculture. The next few years will probably bring problems to both Canada and the United States with regard to unmarketable surpluses of wheat and of pork products. Solution of these problems by either country will involve recognition of the situation in the other and suggests the desirability of joint action.

CONSERVATION EDUCATION IN ARKANSAS

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Accompanying the general impetus in awareness to our natural resources and the need for their conservation, Arkansas has experienced a recent awakening in the same respect and has inaugurated a program of conservation education in its entire public school system.

CONSERVATION AGENCIES

Altho no agency of the State is charged exclusively with administering the conservation program of Arkansas, numerous departments of the government contribute to this endeavor. The Agricultural and Industrial Commission, Arkansas Geological Survey, State Flood Control Commission, State Planning Board, Game and Fish Commission, Parks Commission, Soil Conservation Committee, and several other divisions are contributing toward the development and use of the wide variety of abundant resources with which Arkansas has been endowed. The State Department of Education, however, plays a major role in that it administers the conservation education program of the State.

LEGAL REQUIREMENTS

Recent legal requirements[1] have accelerated the movement in necessitating conservation instruction in the public school system of the State. The teacher training institutions are preparing teachers to carry out this work in the public schools. Training in conservation is a requirement for certification of teachers since the passage of this law. This act requires: (1) that all of the higher State educational institutions shall give instruction in nature study and conservation of natural resources, including fish and game, soil fertility and erosion, forests and minerals, and that all students of such institutions preparing to be teachers shall be required to take such course of instruction; (2) that all of the high schools supported by public funds shall give instruction in conservation of natural resources, including the study of the above-mentioned phases, and that all students of these schools shall be required to take such courses; and (3) that nature study shall be a funda-

[1] Arkansas Statutory Act 312, 1939 Supplement of the School Laws of Arkansas, State Department of Education, 1939.

mental requirement of promotion from grades in at least two of the elementary grades of the public schools.

NATURE OF THE CONSERVATION INSTRUCTION

It is not considered necessary that the introduction of conservation in the public school curriculum should require the development of specific courses in conservation of natural resources. Rather, conservation instruction, in most instances, is being integrated with existing subjects.[2] In fact, conservation in many of its phases is merely an altered point of view of present instruction. Hence, the program consists not of the introduction of new subject matter into the course of study, but rather of presenting traditional facts and data with the viewpoint of developing in the child an awareness of and a desire to use wisely those resources which have been our heritage and which furnish the basis of our economic and social life.

In view of this fact, it is believed that conservation education in the primary and elementary grades is best integrated with nature study. In the final analysis, if nature study, *per se,* does not develop in the child an appreciation of nature and create a desire to protect and perpetuate its attractions and benefits, a question must arise as to its value in a school's curriculum. The approval of the State Board of Education in 1938 of a course of study which includes the teaching of elementary science in all of the grades of the elementary school[3] results in the extension of the time devoted to nature study far beyond the legal requirement and provides adequate opportunities for the introduction of conservation concepts. The time alloted to conservation will depend to some extent upon such factors as interest and need. It is recommended, however, that at least one teaching unit on some phase of conservation be developed in each grade during the year.[4] Such units should probably require from two to six weeks of time.

The very young child of the primary grades may be taught the beauty of nature, and the love and protection of pets and flowers. Therein lie opportunities for laying the foundations of desirable conservation attitudes and appreciations. This is to be achieved

[2] *Nature Study and Conservation,* Bulletin XI, Arkansas Co-operative Program to Improve Instruction, State Department of Education, 1940. (Mimeographed.)

[3] *Outline of State Course of Study for Grades 1 to 8,* State Department of Education, 1940. (Mimeographed.)

[4] *Nature Study and Conservation, op. cit.,* p. 13.

largely thru the medium of stories, either oral or in reading, and thru object lessons with natural phenomena.

Suggested unit titles in nature study for primary grades are as follows:[5]

Animals

*1. Pets at School
2. The Pet Club
3. Our Animal Friends
4. Farm Friends
5. Our Animal Helpers
*6. Our Feathered Friends
7. Our Garden Helpers
8. Cold Weather Birds
9. Signs of Spring
10. How Birds Live
11. Our Fur Friends
12. Pets in the Woods
13. Bird Houses
14. Animal Homes
15. Creeping and Crawling Things

Plants

1. Our Flower Friends
2. Mother Nature's Plant Children
3. How Flowers Grow
4. Flowers Round About Us
*5. Our Tree Neighbors
6. Evergreens
7. Signs of Spring
8. Plants That Give Us Food
*9. Some Common Wild Flowers
10. How Seeds Travel
11. Our Shade Trees
12. Spring Flowers
13. Autumn Flowers
14. Our Plant Friends
15. Beautification of Our School Grounds

Soil

1. The Farm
2. Save Our Soil

Water

1. Weather
2. How Water Helps Us

* Units developed in *Nature Study and Conservation.*

The objective of conservation education in the intermediate grades is to develop the child's interest in soil, water, animals, plants and minerals. An awareness of our dependence upon these elements may begin to be realized. The conservation attitudes and appreciations begun in the primary grades may be strengthened and expanded by observation trips and excursions to fish pools, flower gardens, bird sanctuaries and other local places of interest. Altho it is probably not advisable to present abstract principles of conservation at this age level, protection and common uses of natural resources may be emphasized.

Some suggested instructional units for development at the intermediate grade level are:[6]

Soils

*1. Soils of Arkansas
2. Our Changing Earth
3. How Water Affects Soil
4. Conserving the Soil

Animals and Wildlife

*1. Helping Native Wildlife Live Thru the Winter
2. Creeping and Crawling Things
3. Feathered Tourists
4. Our Debts to Birds
5. Misunderstood Friends of Field and Forest

[5] *Ibid.*, p. 15.
[6] *Ibid.*, p. 56.

6. Fish and How They Live
7. Fish Hatcheries and Their Use
8. Protecting Wild and Domesticated Animals

Forests

*1. Our Forests and Their Value to Man
2. Enemies of Our Trees
3. Trees are Good Neighbors
4. Woodlots and the Farm Income
5. Providing for Conservation of Forests

Plants

*1. The Use of Common Plants
2. Conservation of Wild Flowers
3. How Seeds Travel

Minerals

*1. Minerals of Arkansas
2. Home Use of Minerals

Water

*1. Rivers and Lakes of Arkansas
2. Protecting Life and Property from Floods

Scenic, Recreational and Historical Resources

*1. Our Parks and Their Value to Men
*2. Historic Resources of Arkansas
*3. Scenic Places in Arkansas

* Units developed in *Nature Study and Conservation.*

Conservation in high schools can conveniently and successfully be integrated with science and the social science subjects. These fields are particularly adaptable in junior high school. By its very nature junior high school science deals with practically all of our natural resources. The social science subjects are also well suited to development of many of the social aspects of conservation. With selection of appropriate phases, a unit or units may be taught with history in one grade, with science in another, and with civics or geography in another. At this level the child has a keen interest in nature and in exploration. He is mature enough to understand the necessity of conservation, and life-long impressions of a constructive nature may be formed.

Conservation instruction at the senior high school level may deal with definite principles. Relationships of the various aspects of conservation to our everyday living should receive special attention. Principles of preservation, renewal, utilization and restoration in relation to human welfare may be introduced. Biology and the other natural sciences offer excellent opportunities for integration of units on conservation. An understanding of the "balance of nature" is best developed with the study of biology, since this field deals primarily with the life processes of plants and animals—the renewable resources. At this level conservation becomes more a social and economic problem. In the social sciences, such as sociology, government, economics, geography and American history, there are vital social problems which involve the principles of conservation.

Some suggested units for development in teaching conservation in high school are:[7]

Soils
*1. Soil—Its Source and Uses
2. Satisfying the Needs of Man Thru the Use of Earth Materials
3. Discovery of Better Methods of Producing Crops
4. Effect of Land Use on Homes and People

Forests
*1. Forest Conservation
2. Conserving Our Natural Resources
3. How Man Misuses and Mismanages His Forests
4. Fire, the Red Enemy of the Forest
5. How Diseases and Insects Destroy the Forest
6. Recreational Value of Forests

Wildlife
*1. Fish and Fishing
2. Bird Friends of Man
3. The Fur Trade of Arkansas
4. Using Animals for Man's Welfare
5. Wildlife Sanctuaries in Arkansas
6. Frogs and Their Protection

Plantlife
1. Using Plantlife for the Needs of Man
2. Herbs and Plants Used in Medicines
3. Shrubs and Wildflowers
4. Wild Fruits, Berries and Nuts

Minerals
*1. Minerals—Sources and Uses
2. Production and Use of Fuel Minerals
3. Production and Use of Metallic Minerals
4. Production and Use of Non-Metallic Minerals

Water Resources
*1. Water—Its Sources and Uses
*2. Rivers and Lakes of Arkansas
3. Using the Forces of Air and Water

Scenic, Recreational and Historical Resources
*1. Control and Use of Our Parks and Recreational Resources
*2. Historic Resources of Arkansas
3. Utilizing Nature for Recreation and Enjoyment
4. Providing for the Use of Leisure Time Thru Wholesome Recreation
5. Providing for Wholesome Recreation
6. Municipal and County Parks
7. Urban Parks
8. Uses of Sub-marginal Lands in Park Building

* Units developed in *Nature Study and Conservation*.

[7] *Ibid.*, p. 112.

One of the most logical places for integration of conservation thruout the entire school system is with the study of geography. This subject, in its most modern sense, is a study of the relationships which exist between man and the elements, forces and resources of nature. A geographic study of any region usually culminates in the examination of its resource pattern. From a study of the resources of a region, and their use, it is but the next logical step to point where uses become misuses, and thence to the formulation of plans for better utilization. In this respect conservation may be considered as applied geography.

College Training in Conservation

Altho conservation may make a valuable contribution to a well rounded general education for every college student, the major emphasis in the situation under consideration is in the preparation of teachers. Three major factors are to be considered as courses in Conservation are adapted to the needs of the prospective teachers in the public school systems.[8] (1) The prospective teacher must first aequire the subject matter information necessary for an adequate understanding of the problems of conservation. (2) He should acquire an understanding of the development and maturation of conservation concepts in the minds of children at various age and grade levels. (3) The future teacher should acquire the ability to select and organize subject matter adapted to the grade level in which the teaching is to be done. Professionalization of the contents of college conservation courses is intended to meet this latter need.

Development of the conservation point of view may be promoted by an understanding of (1) the nature and kind of resources to be considered, (2) the need for their conservation, (3) the relation of conservation of natural resources to stability of employment, and (4) practical measures for their conservation. These understandings may be developed from other understandings of (1) the major uses of these resources and the relationships of these uses to maintenance of our present standard of living, (2) the rates at which they are being exhausted, and (3) the possibilities of lowering these rates. An understanding of this latter may be

[8] *Problems or Issues in Teacher Education in Arkansas,* Bulletin III, Seminar in Teacher Education in Conservation, College of Education, University of Arkansas, 1941, p. 1 (Mimeographed).

gained from a knowledge of (1) the causes of wastes and losses incurred in the extraction and uses of representative resources, (2) approved methods by which these wastes and losses may be minimized, (3) the possibility of importation from other regions, (4) the possibility of replacement of the replaceable resources, and (5) the possibility for the use of substitutes.

Development of a comprehensive idea of conservation of natural resources is not possible of attainment at any one grade level. The understandings of proper use of our natural resources are best developed as a part of the concepts of citizenship responsibilities which grow and expand as individual pupils progress thru various maturation levels. Since the proper discharge of this duty has not been executed by many present and past teachers, many teacher trainees arrive at the college level without the basic experiences in the field of conservation and without an adequate understanding of the pupil's environment. It is necessary to include this background as a part of the college course in conservation. Development of these ideas, however, should not encroach unduly upon the attainment of the basic objectives of developing in the prospective teacher the concept of true conservation and in his securing the basic information necessary for a comprehensive understanding of the problems involved. Thus, a college course in conservation of natural resources should provide ample opportunities for the students to acquire the basic concepts of conservation, and at the same time develop those attitudes and techniques necessary for successful teaching of concepts to the public school pupils.

Few present day school texts are written to present conservation ideas to pupils. Well suited materials for presentation to grade school children are relatively limited. For this reason selection and adaptation of subject matter written for other purposes and for more mature minds is an ability which should be developed in the prospective teacher during his college training. A wealth of conservation material is available from many agencies, particularly from various branches of state and federal government. Selection of suitable information and adapting it to the need at hand is an important skill to be acquired, but it requires direction and experience for the beginning teacher. This ability and experience is best acquired during the teacher training period, and should be an integral part of the outcomes of a college course in conservation. This is particularly true in the case of conservation for ele-

mentary school teachers whose approach to the field is thru nature study.

Organization of these materials into instructional units for integration with other subjects requires skill and preparatory training. Some six steps are involved. (1) The first step of gathering and selecting material includes the making of a bibliography of essential references. These should be assembled and made available to students. In addition, the teacher may find it desirable to abstract certain other materials or even write certain items himself. (2) Preparation of an overview of the materials of the unit serves to introduce and orient the subject. It is essential that the teacher be thoroly familiar with the material in order to present it effectively. (3) Generalizations should then be made. Many startling statements are possible and these serve to impress the pupils with the importance of the subject. Some of these may come from the students themselves. (4) General aims should be set up, and specific objectives formulated by the teacher. These will vary in character and number, but an important one should be to challenge the students and evoke from them a desire to actively participate in the solution of the problem under consideration. (5) A teaching approach is next worked out. A field trip to observe the phenomena, class discussions, a visit from a naturalist, forester, sportsman, county agent, or some other informed person, or a newspaper or magazine article may serve to introduce the subject and stimulate discussion. (6) Finally, an evaluation period is reached. Individual, committee or group activities may culminate in a visit to a museum, a field trip, dramatization, making of maps, charts, diagrams or scrapbooks, or other procedures which summarize the instruction and indicate the attainment of the original objectives.

The prospective teacher should engage in activities and gain experiences which he can use directly in his subsequent actual teaching. (1) He should become adept in locating, organizing, evaluating and using materials available in current magazines, newspapers and other publications. (2) He should have experience in planning, organizing and executing field trips,[9] making full use of the knowledge of fellow class members to make these trips provide richer experiences for the entire group. (3) He should be able to plan, organize, execute and evaluate units of instruction.

[9] Suggested procedure and itinerary are given in *Problems or Issues in Teacher Education, op. cit.*, p. 38-41.

Observation of the execution of such a unit, and adaptation of a planned or previously developed unit to a local situation may serve as a preparation to actual participation in the development and application of instructional units. (4) Recognizing the scarcity of materials and equipment suitable to the various levels of maturation, the prospective public school teacher should have experiences in creating original materials appropriate to these levels. He should have practice in fitting the facts and available reading material to his probable future needs. (5) The pre-service teacher should have experience in collecting and preserving appropriate museum materials. (6) He should have practice in handling visual aids, maps, charts, diagrams, models, books, pamphlets, magazines and the other tools with which he should be familiar. (7) He should be able to plan, execute and evaluate a community resource survey.[10] (8) The prospective teacher should have an opportunity to participate in the planning, organization, and evaluation of the conservation course in which he is enrolled. (9) One other experience should come to the prospective public school teacher if at all possible; that is the actual teaching experience gained by apprenticeship in a training school or in some extracurricular activity engaged in some form of conservation education.

COURSE FOR ELEMENTARY TEACHERS

Since the approach to conservation in the primary and elementary school is to be thru nature study, the teacher of those grades must be well grounded in a knowledge of this field and must also have a sufficient background of professionalized training to adapt nature study education to the immediate interests and abilities of the particular level at which he is teaching.

Recognizing the fact that beginning teachers tend to teach what they have been taught as it was taught them, it is suggested that the college course be planned so that its procedures will conform, insofar as is practical, with the type of teaching techniques that are considered best for use in the public school system. In addition to such instructional units as may be presented in the college class, the development or adaptation of additional units by the pre-service teacher is highly desirable. The experiences gained in constructing or modifying units in the college class should prove an incentive to the use of such units in the classroom teaching of the teacher so trained, and should aid in his gaining

[10] Suggested method outlined in *Ibid.*, pp. 42-44.

skills in the adaptation of materials to the appropriate grade level. In this manner, more complete integration will be realized.

A suggested outline for a course in nature study and conservation for prospective elementary school teachers is as follows:

I. Introduction
  1. Nature—Man's Surroundings
  2. Resources—Nature and Kind
  3. The Balance of Nature
  4. Conservation of Resources
II. Man and His Environment
  1. Interrelation of Resources
  2. Soil—The Foundation of Life
  3. Plant Life—The Source of Food
  4. Animal Life—Man's Companions and Helpers
  5. Water, The Necessity of Life
  6. Mineral Resources and Their Conservation
  7. Recreational and Historical Resources

COURSE FOR SECONDARY TEACHERS

If the high school teacher is to be effective in influencing the development in his pupils of wholesome attitudes toward citizenship responsibilities thru an understanding of the value of natural resources to our present and future economic life, he must first acquire this attitude himself. The development of this "conservation attitude" in the prospective teacher is the first and foremost task of the college teacher. Of course, it is presumed that the college teacher himself will have developed this attitude in his own thinking.

In the development of this attitude of approach the pre-service teacher should acquire an understanding of the nature and kind of resources to be considered, the need for their conservation, and recommended methods thru which they may be conserved. It is expected that he will incidentally acquire a fuller appreciation of the relation of the wise use of our natural resources to stability of employment and income, and to the permanence of communities whose existence and well being depend upon those resources.

Some suggested subjects for the development of instructional units in the college class for secondary teachers are as follows:

I. General—The Balance of Nature
II. Soils
  1. The Soil Conservation Problem
  2. Soil Depletion and Erosion
  3. Soil Conservation Principles and Practices
  4. Application of Working Plans to Type Situations

III. Forests
  1. The Need for Forest Conservation
  2. Economic Importance of Forests
  3. Our Forest Resources
  4. Forest Utilization and Depletion
  5. Essential Measures for Forest Conservation
  6. Proper Forest Management

IV. Water Resources
  1. Our Water Problems
  2. Uses and Abuses of Water
  3. Developed and Undeveloped Drainage Basins
  4. Application of Conservation Principles

V. Minerals
  1. Minerals—Sources and Uses
  2. Production and Use of Fuel Minerals
  3. Production and Use of Metallic Minerals
  4. Production and Use of Non-Metallic Minerals

VI. Wildlife
  1. Our Wildlife—Resources and Uses
  2. Economic, Social and Recreational Values
  3. Shrubs and Wildflowers
  4. Fish and Fishing
  5. Bird Friends of Man
  6. Fur Bearers and the Fur Industry
  7. Predators and Their Control
  8. Wildlife Sanctuaries and Refuges

VII. Recreational and Historical Resources
  1. Parks and Recreational Resources
  2. Historic Sites and Landmarks
  3. Forest, Field and Stream for Recreation
  4. Roadside Beautification
  5. Recreational Use of Leisure Time
  6. Submarginal Lands for Parks and Recreation

THE FUTURE OF CONSERVATION EDUCATION IN ARKANSAS

With the conservation education program of the State functioning fully, Arkansas should have an excellent future for the development of citizenship responsibility in its public school pupils. Adequate training of teachers will help more than any other thing to reach this goal. In-service training of the present teachers would hasten the attainment of this status. Complete realization of this condition is not to be expected, however, until the teachers of today are succeeded by the generation of teachers which is now being trained or which will be trained within the next few years. Placement of conservation-minded teachers in the school systems of the State will serve to spread the attitude to be achieved among those teachers already in service and hasten the time when the set-up desired will actually exist in every classroom of the State.

INEXPENSIVE OR FREE MATERIALS FOR GEOGRAPHY CLASSES

Hadwen Harry Williams
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Since the beginning of World War II it has not been possible to get large quantities of free materials about Europe, Asia or Africa. With the public increasingly interested in the Americas, teachers are fortunate because material covering this hemisphere is now more plentiful than ever.

To find out what material about the eastern hemisphere can be obtained, one may look in the travel section of a Sunday New York newspaper. Whatever is available will be listed there. Similar advertisements are in *Harper's Magazine,* in *Travel* and in *Asia.*

Fortunately there is a large amount of material about North America, and especially about the United States. For information about Canada, a postal sent to the Canadian Travel Bureau in Ottawa will bring good results. This bureau serves the whole Dominion; each province has in its provincial capital a similar bureau for that province. The Canadian railroads likewise send out folders and maps.

Mexico City can be reached by auto from Laredo, Texas. The Laredo Chamber of Commerce is generous with maps and folders. Northwest Mexico and Chihuahua are served by the Gateway Club of El Paso, Texas.

Maps and folders relating to the United States are too numerous to mention. The Greyhound Bus Company, which advertises in the *Saturday Evening Post,* has good descriptive folders. The oil companies have many kinds of maps and folders for free distribution. Among these are several outstanding items: a 15 x 22 inch map of the United States put out by the Conoco Travel Bureau of Denver, Colorado, is excellent. A Touraide issued by the same company will be sent free upon request. This is a 9 x 12 inch book made especially for the applicant. It contains one large map that shows the whole of the proposed trip, followed by sectional maps and pages of descriptive matter. The whole book is bound with spiral fastener. It is free; all one needs to do is to send a postal card, giving names of cities at start and finish of the tour, with route desired. The Ohio Oil Company of Findlay, Ohio, sends free the Marathon Touring Guide, which is a 9 x 12 road atlas covering

all the roads in Canada, United States, and Mexico. All of the maps are double-page size.

Most of the oil companies send road maps to cover any desired tour. The address of the company is usually given on the road-maps which it issues.

For official road-map of any state, one may send to the State Highway Department at the capital of the state.

Washington, D.C., is the greatest source of maps relating to this country. The National Park Service sends free illustrated booklets about the National Parks. The Department of the Interior has similar booklets about the National Monuments. The Forest Service sends a small map showing the location of all National Forests, and addresses of the District Foresters. Each Forester will send free a map of the forest under his supervision.

The Appalachian Trail, that extends from Maine to Georgia, is supervised by the Appalachian Club of No. 5 Joy Street, Boston, Massachusetts. The Green Mountain Club of Rutland, Vermont, has information about the Green Mountain Club. A similar organization on the Pacific Coast is the Mazama Club, No. 6 Pacific Building, Portland, Oregon.

The United States Geological Survey, Washington, D.C., has maps that show contours and many other features. These maps may be had for most of the United States. They are low in price and are useful in making relief maps. An index map for any state will be sent free.

The United States Coast and Geodetic Survey, also of Washington, sells maps showing coasts and harbors of all regions under the control of the United States.

Information about any branch of the government service, its activities and publications, may be had from the U. S. Information Bureau, Washington, D.C.

The United Fruit Company of New Orleans, Louisiana, sends free literature about its tours to Central America. The Carnegie Institution of Washington, D.C., sells at a low price its well illustrated booklets about the Maya ruins in Central America.

Second-hand bookstores often sell old magazines. If the *National Geographic Magazine* can be found among them, they will furnish material about certain regions now in the war zone.

American railroads have good folders about the regions they serve. The *Railroad Guide,* to be seen at any railroad station, con-

tains information of interest to geography students. So does the *Postal Guide,* which can be consulted at any postoffice. These guides are not given away; they are sold.

In writing for free material, writing should be done by the teacher, and *not by the pupils.* Companies are usually glad to cooperate with schools, and thus bring their product to the attention of the public.

The amount of material available at little or no cost is almost endless. While it was possible a few years ago to accumulate a large amount of material about foreign regions, it is now possible to get a similar collection of folders about the United States, Canada, and Mexico. This is a good thing because pupils need information about places nearer home than are Cape Town, Sydney and Darjeeling.

In addition to the travel booklets which may be sent for, there is geography material all around us. Ripley's *Believe It or Not* pictures often contain items for the scrap book or bulletin board. Pupils get information about geography from matchbook collections, more from collections of postage stamps. Newspapers and magazines are full of pictures and articles that appeal to pupils. *Life, Time, Cosmopolitan, Saturday Evening Post, Survey Graphic, Newsweek,* and many more will repay perusal. There is material in the movies, both in the travelogs and in the features. The background of the feature may be real or simulated; if the latter, it is probably well done. Pictures that have a geography angle include the *Thief of Bagdad, Hurricane, Honolulu, Good Bye Mr. Chips, Blackout,* and many more. Radio furnishes material useful in geography work. Newscasts on Saturday night that tell what happened in Europe on Sunday morning, show the difference in time. Foreign news is especially valuable on geography work.

More important than the kind of material obtained and used is the way that it is presented to pupils.

INTEREST-STIMULATING DEVICE

Stimulation for the study of geography is greatly increased by variation. This variation must accomplish the same purpose as the direct methods of drill, discussion and testing.

In order to stir, or continue, interest in my geography classes I have been using geography word puzzles. The advantages of the puzzles are two fold: (1) The students will "dig" for the information without thinking of it as a "cut and dried" research assignment; (2) the teacher will find it a novel way to freshen the mind on geographical detail that is the quality mark of a good geography teacher.

A sheet of the puzzles should cover the main points of the material studied during the previous month. Hectographing makes an inexpensive aid in this project. Enough puzzles should be made to occupy the children's time for the particular period in which they are to be used.

I occasionally place a map location puzzle on the board with the introduction of a new country or continent.

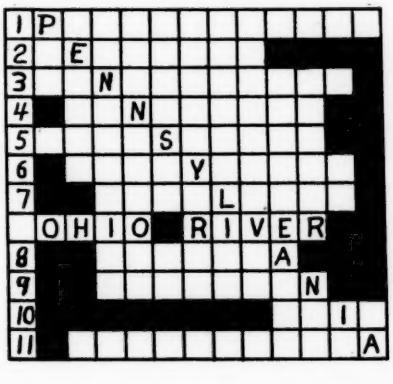
Here are two typical puzzles that I have used as aids in the teaching of geography.

Directions: Look at the list of helps at the side of the puzzle. When you think you have found the answer to the line try to place it on the puzzle. Place one letter in each vacant block. The key word on that line is part of the correct word and will help form the answer.

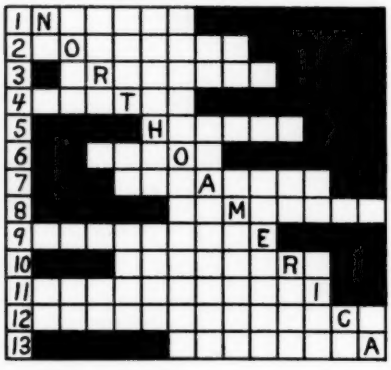
CITIES AND RIVERS OF PENNSYLVANIA

Helper List

1. Largest city along the Delaware River. (Philadelphia)
2. River flowing between Pennsylvania and New Jersey. (Delaware)
3. River that unites with the Allegheny River to form the Ohio River. (Monongahela)
4. City in the Pennsylvania tobacco district. (Lancaster)
5. The Smoky City (Steel industry). (Pittsburgh)
6. Pennsylvania battlefield of the Civil War. (Gettysburg)
7. Name of a Sacred City in Palestine found in Eastern Pennsylvania. (Bethlehem)
8. City near the scenic Horseshoe Curve of the Pennsylvania Railroad. (Altoona)
9. City in the Anthracite coal region. (Scranton)
10. Pennsylvania city along Lake Erie. (Erie)
11. Pennsylvania river flowing into Chesapeake Bay. (Susquehanna)



RIVERS OF NORTH AMERICA



Helper List

1. River flowing into Hudson Bay. (Nelson)
2. River flowing through Grand Canyon National Park. (Colorado)
3. River flowing through Arkansas. (Arkansas)
4. River flowing into the Missouri River south of Omaha, Nebraska. (Platte)
5. River forming the eastern end of the New York Barge Canal. (Hudson)
6. Largest river in Alaska. (Yukon)
7. River forming the boundary between Pennsylvania and New Jersey. (Delaware)
8. River in Labrador. (Hamilton)
9. Canadian river flowing into the Arctic Ocean. (Mackenzie)
10. River that unites with the Mississippi River to form the longest river system in the world. (Missouri)
11. River of the United States that has been called, "Father of Waters." (Mississippi)
12. River that forms the Canadian-United States boundary from the Great Lakes to the Atlantic Ocean. (Saint Lawrence)
13. River of northwestern United States upon which is located the new Grand Coulee Dam. (Columbia)

SUGGESTED LIST OF TOPICS FOR PUZZLES: Rivers, Mountains, Lakes, States, Capitals, Cities, Seaports, Fish, Trees, Grains, Animals and Countries.

I shall be glad to furnish puzzles from my collection to geography teachers if they write me stating their needs. Please enclose a self-addressed stamped envelope.

ROBERT ELWOOD GENSLER

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Shippensburg, Pa.

EDITORIAL NOTES AND NEWS

In December our readers were asked for additional information concerning geographers who had been called into war service. Since that request was written we have suffered the tragedy of Pearl Harbor and we are now in an all-out war, the end of which is still invisible beyond the horizon. Nearly all colleges of the country have reoriented their normal procedure so as to give maximum assistance to our country. Many geographers are now contributing, "behind the lines," as it were, in our colleges and universities. Among those who have been called into more direct service, and not previously listed, are the following.

Office of the Co-ordinator of Information

Robert J. Voskuil (Illinois)
Joseph A. Russel (Syracuse)

Aviation

Guilbert Graham (High School, Zanesville, Ohio)
Major Clarence Koeppe (State Teachers College, Springfield, Mo.), Director Civilian Training, Signal Corps, 7th Corps Area

Office of Production Management

Paul Icke (Wisconsin)

Board of Economic Warfare

George B. Cressey (Syracuse), Consultant

According to the 1940 Census, there are six times as many tractors on farms in the United States as there were in 1920. Nearly a quarter of all our farms now have tractors. The state with the highest percentage of farms with tractors is North Dakota, where 59 per cent are so equipped. Mississippi is lowest with 1.4 per cent of its farms having tractors. As one thinks of tractors, one must visualize the mechanized units back of them, such as combines, plows, drills, corn pickers, potato diggers, and cultivators of various sorts. The man power thus released from the farm, by the use of these mechanizations, without curtailing production on the farm, has helped to make possible our present level of industrial production in cities. In view of our defense program it is probable that further farm mechanization will be increased, at least in the states that are below the national average. It is not strange that a tractor makes the appeal it does, when one realizes the manual labor it saves. For example, one man with a tractor may operate a two-row corn picker and wagon and in the course of a day pick three-fourths of a thousand bushels of corn. The only other laborer needed is one to haul the corn to the crib. It is not surprising then that the farm population of the United States in the past two decades has not materially changed. Thus in 1920 there were 11,362,000 persons employed in agriculture, while in September, 1941, there were an estimated 11,017,000. The tractor has probably saved 200,000,000 man-hours of field operations a year and eliminated 10,700,000 horses and mules. The latter permitted a shift of 30,000,000 acres of feed crops to other production. The tractor thus symbolizes modern farm mechanization, and the story of its success is but another chapter in the saga of the American farm.

According to the Bureau of the Census, the 1940 center of population of the United States is located two miles S.E. by E. of Carlisle, Indiana, 36 miles south of Terre Haute.

During the decade from 1930 to 1940, the center of population moved 13 miles westward and 7.9 miles southward. The term center of population, as used by the Census Bureau, is that "point upon which the United States would balance, if it were a rigid plane without weight and the population distributed thereon, with each individual being assumed to have equal weight and to exert an influence on a central point proportional to his distance from the point." The center of population was farthest north in 1790 when it was 23 miles east of Baltimore, Maryland, as compared with the present center which is the farthest south it has ever been.

Since the Free French forces and their British allies took over Syria, in September, 1941, that former French mandate has been organized into four states known collectively as the Levant States. Their president is a native sheik. The significance of the Levant States is apparent when it is recalled that this area is crossed by the pipe line, from the Kirkuk oil field in Iraq, which terminates at the Mediterranean seaport, Tripoli. The southern pipe line from the same field ends at Haifa, Palestine. The northern pipe line was closed when France fell in the summer of 1940. Both lines are thus in British control. More or less paralleling these pipe lines are motor roads to Baghdad and thence to points east and south, as well as air lines formerly flown by British, French, and Dutch planes to the Middle and Far East.

Salmon continues to be the highest valued export from Alaska, outstripping gold about 2 to 1. Alaska accounts for about 90 per cent of our salmon, the remainder coming from Oregon and Washington. The salmon pack in pounds is nearly equal to that of all of our other canned fish, most of which is tuna, sardines, mackerel, and shrimp. The largest production of salmon is the pink variety which is about half the salmon pack. Next largest is red. The principal type canned in continental United States is the Chinook or King Salmon of the Columbia River. It was feared by some that the latter would soon become extinct due to the Bonneville Dam; but its fish ladders are apparently enabling the adult salmon to get upstream to spawn and the fingerlings, downstream to the ocean, since a record run was reported at the opening of the 1941 season. Altho this past year's pack of pink salmon exceeded that of the 1935-39 average, the red salmon pack was below the average. This shortage of the red pack, together with the consignments of red salmon to our armed forces and lend-lease program, makes red salmon supplies below normal for civilians. Pink salmon is also being purchased by federal agencies and is in active demand in England due to its protein content being higher than that of red salmon. Supplies of any salmon may thus be lacking on our grocer's shelves since the next pack will not start till July, 1942.

DR. CLYDE F. KOHN, formerly of the Mississippi State College for Women, Columbus, Mississippi, is at Harvard University taking the place to Dr. Edward A. Ackerman who is in the government service in Washington, D.C.

Articles in recent issues of *Time, Life,* and the *National Geographic Magazine* dealing with Outer Defences of the United States have been briefly annotated and arranged in a classified bibliography in the October issue of the *Bulletin of the Nebraska Council of Geography Teachers.* The *Bulletin* is available from Frank E. Sorenson, Teachers College, 125, University of Nebraska.

GEOGRAPHICAL PUBLICATIONS

Adamson, Hans Christian. **Lands of New World Neighbors.** 593 pp. McGraw-Hill Book Co., N.Y. 1941. $2.75.

"This book, for the first time in radio history, allies the printed page with radio broadcasts. Written by the author of New Horizons broadcasts of Columbia's School of the Air of the Americans, each chapter closely parallels one of the 26 broadcasts in this series."

"Jointly sponsored by the National Education Association and the American Museum of Natural History, the New Horizons series and this book dramatize the exploration, natural history, geography, and history of the entire Western Hemisphere.

Thus do the publishers introduce "Lands of New World Neighbors" to the reader. Of the 26 chapters making up the book, fifteen or over half are devoted to Latin America; two are concerned with Hawaii and Alaska; three give attention to Canada and to a much lesser extent Greenland; and the last six discuss sections of continental United States.

Chapter headings such as "Queen of the Caribbean," "Roof of America" and "Land of Vast Horizons" encourage reader interest. At least one, however, is misleading, "Lands of the Spanish Main." Most authorities do not consider the Central American countries, which are discussed under this title, as belonging to the Spanish Main and limit that area to the northern shores of South America.

At the beginning of the study of each country, approximately half a page of generally useful encyclopaedic material is given in fine print under the headings "Discovered," "Population," "Area," "Language," "Government," "Capital," "Geographical Characteristics," "Climatic Conditions" and "Principal Products." Some of the geographical material in such sections is not entirely clear and balanced. For example, the geographical characteristics of Venezuela, p. 178 "range from a mountainous area in the northwest to densely forested area in the southeast." Unfortunately the reader gets no idea whether the northwest mountainous area is forested or the southeast forested region is mountainous.

Following the concise factual material in fine print the author describes highlights in each country's history and exploration, a treatment which makes attractive reading and encourages the reader to ask for more. Thruout this description personalities receive the major attention. Obviously not all famous people and events can be described in one book but the author has shown skill in choosing and describing key men and vital incidents of Western Hemisphere history.

A geographer reading the book may be disappointed by the lack of more than a minimum emphasis on that subject. Furthermore, the author shows much less facility with geographic knowledge than with historic description. For example, one is a little disturbed to read on page 336 concerning the limited number of climatic controls: "Climate depends on three factors: distance from the equator; height above sea level; distance from warm ocean currents."

All in all the book contains a wealth of worthwhile information presented for the most part in an interesting manner. It will serve a useful purpose in the libraries of all schools emphasizing the social sciences as a part of their curriculum.

EARL B. SHAW

State Teachers College
Worcester, Mass.

Edward A. Ackerman. **New England's Fishing Industry.** 303 pp., 122 photographs, 33 tables and charts. University of Chicago Press, 1941. $4.00.

This is a type of book that tempts one to be fulsome. Ackerman has done a commendable piece of work in marshaling his facts and in presenting them in a manner that is logical and popular. There has been a need for a book of this kind and while New England's fisheries are today only a small part of the commercial fisheries of the United States and at a low production level in New England's fishery history, a number of factors make this more than a study of local worth. The book is described as a regional study, justly, and gives a broadening definition to that branch of geography. The book sheds light for the teacher and the layman on many uncertain and unknown phases of the industry without which a clear picture cannot be formed; and it fills a gap that has existed too long in New England's industrial history. Some geographers in times past have questioned whether or not descriptions of machines and equipments are essential or even admissible in a geographic study, but the elimination of the chapter on fishing gear from this book would certainly detract from the story.

Ackerman opens the book with a discussion of the place of fisheries in New England regional life, presents the general locational factors of fisheries and then describes with considerable detail the New England fishing grounds. In addition to an explanation of the fishing gear as used and adapted to conditions in the New England area, the author defines the limitations of the industry as made by general regulations and laws, and finally treats of markets, marketing methods, and dependent industries.

The book is extensively illustrated with photographs and maps, and it can be highly recommended to a wide range of scientists, teachers and laymen.

ROBERT M. BROWN

Rhode Island College
of Education

Charles F. Reid. **Education in the Territories and Outlying Possessions of the United States.** Columbia University. Contributions to Education, No. 825. 593 pp. Bureau of Publications, Teachers College, Columbia University. New York. 1941. $3.85.

This study is a critical treatment of the problems of education in Alaska, Hawaii, Puerto Rico, Guam, American Samoa, the Canal Zone, and the Virgin Islands. The historical development of education in each area is traced against the background afforded by its distinctive cultural, social, economic, and political pattern, and the progress in education made since each area was acquired by the United States. The present scope and organization of education is described and appraised with respect to its adaptation to local needs and the cultural status of the communities to be educated. Among the topics discussed are the curriculum, the variety and extent of educational opportunities, the problem of language instruction, the qualifications and salaries of the teachers, the school buildings and equipment and the administration of the system. The current practices and trends are compared with those of continental United States, and recommendations are offered to promote educational growth.